WTC Health Effects Research Activities



Claudia Thompson Ph.D. Program Administrator NIEHS

World Trade Center Related Articles

Health Studies	66
Exposure Assessment	20
Animal Studies	4
Other	135

Source: PubMed

Health Effects Research

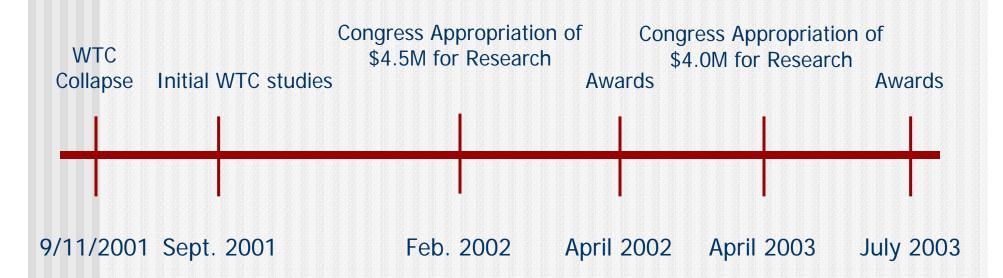
General Population – 42 Publications

Workers - 24 Publications

•	Mental Health	19
•	Respiratory Effects	9
•	Cardiac Effects	5
•	Pregnancy Outcome	5
•	Other	4

•	Mental Health	2	
•	Respiratory Effects	13	
•	Cardiac Effects	0	
•	Other	9	

Timeline of NIEHS WTC-Related Activities



Congressional Appropriations

In 2002 and 2003, the VA HUD and Independent Agencies sub-committee of Congress provides NIEHS with funds to support WTC research activities in the following areas:

- exposure assessment
- clinical and epidemiology studies
- community outreach

Awardee Institutions

- Columbia University
- Johns Hopkins University
- Mount Sinai School of Medicine
- New York University
- University of Medicine and Dentistry of New Jersey
- University of North Carolina, Chapel Hill

Exposure Assessment Activities

Sample Analysis

- An exposure assessment of indoor air quality (2002, 2003 UMDNJ).
- Analysis of collected air and dust samples (Columbia 2002)
- Analysis of collected indoor and outdoor settled dust samples and air samples for elemental and chemical composition (2002, 2003 NYU)
- Analysis of PAH levels in filter samples gathered by EPA at ground zero during the weeks following the WTC collapse 2002, 2003 UNC)

Exposure Assessment Activities

Exposure Models

- Analysis of ambient conditions at the WTC site one year later (2003, NYU)
- Exposure assessment employing NASA's Airborne Visible Infrared Imaging Spectrometer (AVRIS) for remote sensing imagery for quantitative assessment of WTC plume emissions (2002, 2003 Columbia)
- The development of a GIS/RDBS micro-environment model (2002,2003 UMDNJ)
- Spatiotemporal mapping (2002, 2003 UNC)

Human Health Effects Research

General Population

- WTC resident respiratory impact study to examine prevalence for respiratory symptoms, especially new onset of asthma-like symptoms (2002, 2003 NYU)
- An epidemiological study of pregnant women and children to assess pregnancy outcomes and relationships to fetal/child development (2002, 2003 MSSM & Columbia)
- A reproductive outcome study (2002, 2003 UMDNJ)
- A qualitative risk assessment to assess perceived community concerns and documentation of actual risks (2002 UMDNJ)
- Integrate exposure data with residents post-traumatic stress, depression and panic (2002, 2003 UMDNJ)
- A pilot study to initiate validation of a newly developed personal passive air particulate monitoring device (2002, 2003 UNC)

The World Trade Center Residents' Respiratory Health Study: New-Onset Respiratory Symptoms and Pulmonary Function

Joan Reibman, 1* Shao Lin, 2* Syni-An A. Hwang, 2 Mridu Gulati, 1 James A. Bowers, 2 Linda Rogers, 1 Kenneth I. Berger, 1 Anne Hoerning, 1 Marta Gomez, 2 and Edward F. Fitzgerald 2

¹New York University School of Medicine, Department of Medicine, Division of Pulmonary and Critical Care Medicine, New York, New York, USA; ²New York State Department of Health, Albany, New York, USA

All Respondents n = 2.812

Exposed n = 2,520

Previous respiratory diagnosis n = 417 16.6%

Previously normal n = 2,103 83.4%

Control n = 292

Previous respiratory diagnosis N=41 14.9% Previously normal n = 251 86.0%

Results

Table 2. New-onset respiratory symptoms (percentage) in previously normal residents.^a

Symptom	Exposed (n = 2,103)	Control (<i>n</i> = 254)	Crude IR (95% CI)
Any cough without cold	40.6	12.1	3.36 (2.38-4.74)*
Nighttime cough	36.7	11.7	3.15 (2.21-4.48)*
Wheeze	28.4	6.6	4.32 (2.68-6.98)*
Daytime SOB	27.2	10.4	2.62 (1.80-3.83)*
Morning chest tightness	23.7	7.9	3.00 (2.15-6.94)*
SOB after exercise	18.1	4.7	3.86 (2.15-6.94)*
Nighttime SOB	15.8	4.5	3.48 (1.94-6.25)*
Any of the above symptoms	55.8	20.1	2.78 (2.17-3.56)*

^aNo diagnosis of asthma, chronic obstructive pulmonary disease, chronic bronchitis, or other lung disease before 11 September 2001. *Effect still statistically significant after adjusting for age, sex, education, smoking, and race.

Results

Table 3. Persistent^a new-onset respiratory symptoms (percentage) in previously normal residents.

Symptom	Exposed (n = 2,103)	Control (n = 254)	Crude IR (95% CI)
Cough without cold	16.0	4.0	3.99 (2.15-7.38)*
Nighttime cough	12.9	3.7	3.51 (1.83-6.72)*
Wheeze	10.5	1.6	6.50 (2.44-17.33)
Daytime SOB	10.6	3.6	2.94 (1.53-5.66)*
Morning chest tightness	8.4	1.6	5.21 (1.95-13.91)*
SOB after exercise	7.4	1.7	4.45 (1.66-11.91)*
Nighttime SOB	6.2	0.8	7.64 (1.90-30.70)*
Any of the above symptoms	26.4	7.5	3.53 (2.28-5.47)*

^aSymptom frequency ≥ 2 days per week in the past 4 weeks. *Effect still statistically significant after adjusting for age, sex, education, smoking, and race.

Summary of Results

New onset respiratory symptoms

Exposed – 55% Control – 20.1%

Persistent new onset respiratory symptoms

Exposed – 26.4% Control – 7.5 %

No differences in screening spirometry

Possible increased hyper responsiveness in exposed individuals with persistent symptoms

Pregnancy Studies - Results

- Two-fold increased risk of having a small for gestational age birth (birth wt below the 10th percentile for gestational age)^a
- Lower cortisol levels in mothers (p=.03) and babies of mothers (p = 0.008) who developed PTSD in response to 9/11. Most apparent in babies born to mothers with PTSD in third trimester^b.

^A Berkowitz et al – JAMA August 6, 2003 – Vol 290, No. 5

^B Yehuda et al – J Clin Endocrin & Metab May 3, 2005

Pregnancy Studies - Results

Outcome	Coefficient Model 1	Coefficient Model 2	Predictor
Birth weight (n = 295)	-149 grams p = .012	-122 grams p= .024	resided within 2 miles
Birth length (n = 287)	-0.819 cm $p = .026$	-0.737 cm $p = 0.039$	resided within 2 miles
Head circumference (n = 286)	-0.477 cm $p = 0.010$	-0.300 cm $p = 0.096$	1st trimester on Sept 11

Lederman et al – EHP Dec 2004 - Vol 112, No. 17

Biomarkers of Exposure among pregnant women near the WTC

- Detectable PAH-DNA adducts are observed in maternal blood and cord blood samples.
- PAH-DNA adducts were seen among women whose blood was collected sooner after 9/11.
- There appears to be no significant relationship between adduct levels and exposure index (EI)
- Weekly summary of EI was associated with strongly with perception of air quality (PAQ)
- No significant associations between metal biomarkers (Pb, Cd, Co, Sb, U) or organochlorines and EI or timing of blood draw.

Biomarkers of Exposure among pregnant women near the WTC

- Mean PAH-DNA concentrations in maternal and cord blood and the proportion of samples with detectable adducts, increased across populations with increasing estimated ambient exposure to PAH (Northern Manhattan < WTC < Krakow < Tongliang)</p>
- PAH-DNA adducts in newborns were similar to or higher than found in mothers, although fetus has an estimated 10-fold lower PAH dose

World Trade Center Related Activities

Worker Populations

- A clinical and epidemiology study of ironworkers at the WTC to investigate respiratory abnormalities and Post-Traumatic Stress (2002, 2003 MSSM)
- A WTC-NYC firefighters clinical study to assess cardio-pulmonary effects (2002, 2003 NYU)
- Registry of WTC site clean up workers (2002, 2003 JHSPH)
- Respiratory symptoms and psychological health assessment of WTC workers (2002, 2003 JHSPH)
- Personal exposure assessment of WTC workers (2002, 2003 JHSPH)

World Trade Center Clean Up and Recovery Worker Health Survey PI: Alison Geyh Johns Hopkins Bloomberg School of Public Health

Study population:

- WTC workers identified by 3 NY local labor unions and the NYC Department of Sanitation
- non-WTC workers identified by 2 NY local labor unions

Survey:

- mailed questionnaire
- 4546 WTC workers
- 2103 non-WTC workers
- sent March June 2003

Response:

- 1131 WTC workers
- 224 non-WTC workers
- received June 2003-June 2004

Questionnaire included:

Exposure

- first/last day on site
- number of days on site
- respirator use
- airborne contaminants/human remains

Respiratory health

- current cough, wheeze, phlegm
- historical cough, wheeze, phlegm
- smoking

Mental health

- post traumatic stress disorder
- depression
- anxiety
- quality of life

Historical health

Risk of respiratory symptoms associated with ever/never exposure at WTC

Symptoms	OR	95%	6 CI
Cough	1.78	1.29	2.46
Shortness of breath	1.72	1.25	2.37
Phlegm	1.23	0.96	1.57
Wheeze	1.67	1.23	2.28

Assessing the impact of ever being at the WTC on current (at the time the questionnaire was completed) lower respiratory symptoms (LRS). Compared with those who were never at the disaster site, WTC workers were at greater risk for all LRS. These results suggest that having ever worked at the WTC is associated with an increased risk of cough, shortness of breath, phlegm, and being wheezy. These associations were statistically significant for all symptoms except phlegm

Selected Current Mental Health Problems by Work on WTC Site

Characteristic	Worked on Site	Did Not Work on Site
	N (%)	N (%)
PTSD (DSM-IV criteria)**	149 (13.5)	12 (5.7)
PTSD (PCL score ≥50)**	118 (10.4)	8 (3.6)
PTSD (strict definition)**	112 (10.2)	7 (3.3)
Major depression****	178 (16.1)	9 (4.4)
Generalized anxiety disorder*	54 (5.9)	4 (2.0)
Panic attack(s)****	264 (24.1)	21 (10.1)
Panic disorder**	78 (7.2)	3 (1.5)

*P<.05
**P<.005
***P<.0005
****P≤.0001

There was significant prevalence of posttraumatic stress disorder (PTSD) and depression in the cohort. As compared with those who were never at the disaster site, WTC workers demonstrated significantly higher prevalence rates for all mental health symptoms for which we queried.

Respiratory Symptoms in Worker Populations

Clinical Syndrome	Clinical Syndrome	Study cohort
RUDS	Nasal congestion/drip, sore throat, sinusitis	FDNY firefighters; iron workers; ESU police; technical, law enforcement and construction workers
Lower respiratory tract - WTC cough	Productive cough, wheeze, SOB, chest tightness	FDNY firefighters
RADS	Cough, wheeze, dyspnea	FDNY firefighters
LRT symptoms	Cough, wheeze, dyspnea, chest tightness	FDNY firefighters; iron workers; ESU police; technical, law enforcement and construction workers
LRT PFT abnormalities		FDNY firefighters; ESU police officers; iron workers
Gastrointestinal tract	Persistent upper GI complaints incl. heartburn	FDNY firefighters; rescue and clean-up workers
Eosinophilic pneumonitis		FDNY firefighter
Granlomatous pneumonitis		Power engineer

Unanswered Questions

- Will pulmonary disease persist in workers and the general population exposed to WTC dust?
- Will exposure to airborne dioxins and furans in lower Manhattan in days and weeks after 9/11 increase risk of cancer, diabetes, or other chronic disease?
- Will there be long-term adverse effects on growth or development to children born of mothers exposed to WTC contaminants?